NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

SURFACE ROUGHENING

(Ac.)

CODE 609

DEFINITION

Performing tillage operations that create random roughness of the soil surface

PURPOSES

- Reduce wind erosion
- Reduce dust emissions into the air
- Reduce deposition of soil into surface water
- Protect plants from abrasion by wind blown particles.

CONDITIONS WHERE PRACTICE APPLIES

On soils that have a surface layer suitable for clod formation and have a high potential for wind erosion due to lack of surface cover. This practice should not be used as a primary erosion control practice. It is a temporary, seasonal, emergency conservation measure and does not provide long-term benefits.

This practice applies on soils whose surface layer has a wind erodibility factor (I) value of 104 or less. The 104 I is an irrigated value developed to account for the decreased erodibility of a 134 I value soil (see the National Agronomy Manual, Exhibit 502-2).

CRITERIA

Criteria Applicable to: Reducing Wind Erosion; Reducing Dust Emissions; And Reducing Soil Deposition into Surface Water

Tillage operations done for this purpose, which do not produce repeating ridges, will produce random roughness (RR) values (inches) large enough to achieve a 25% reduction in the potential erosion rate (soil "I" value), **OR** reduce wind erosion during the management period by 25% as determined by the currently approved wind erosion technology.

The random roughness (K_{rr}) value used to estimate wind erosion shall be determined from Table 1. **Random roughness (K_{rr}) shall be equal to or less than 0.75.** The shaded area shows the RR – "I" factor combinations that meet the 25% reduction criterion.

Table 1. K_{rr} from Random Roughness

(RR) and "I" Factor Values[1]

RR (in)	I = 104	I = 86	I ≤ 56
0.2"	1.0	1.0	1.0
0.4"	0.95	0.86	0.70
0.6"	0.88	0.76	0.51
0.8"	0.82	0.68	0.40
1.0"	0.78	0.62	0.34
1.2"	0.74	0.57	0.30
1.4"	0.72	0.54	0.27
1.6"	0.69	0.51	0.24

[1]*Note-I factor values >134 have a K_{rr} = 1.0, & the I of 134 soil will not reach a 25% reduction at any RR.*

Random Roughness (RR) values shall be estimated from the field operation table for random roughness [see the National Agronomy Manual Part 502, Exhibit 502-7], or estimated using the roughness pictures in Agriculture Handbook 703 Appendix C, pages 339 to 347.

Emergency tillage (surface roughening) can be done on soil with an "I" factor greater than 104 using deep tillage, when soil moisture is adequate to create a stable aggregate (clod) and when finer soil material can be brought to the surface.

Perform the initial tillage operation as soon as erosion starts, or as soon as it is evident that the existing cover or surface roughness is inadequate to control erosion below an acceptable level.

Begin surface roughening operations on the windward (up wind) edge of the field.

Tillage that produces ridges and furrows will be done as close to perpendicular to the direction of the damaging wind as possible.

Optimum ridge dimensions are 2 – 5 inches in height with a height to spacing ratio of 1:4.

Surface Roughening will comply with all federal, state, and local laws and regulations.

Criteria to Protect Plants from Abrasion by Wind Blown Soil Particles

Surface crusts generally reduce soil erodibility. However, certain smooth, crusted soils with loose grains (sand size particles) on the soil surface may cause crusts to abrade rapidly. These soils include loamy fine sands and sandy loams that have significant portions of sand on the surface when crusted. They also include certain calcareous loams, silt loams, and silty clay loams that tend to form sand sized aggregates in the surface when crusted.

Tillage operations for this purpose will produce random roughness sufficient to reduce or eliminate surface creep (roller phase) and saltation during crop emergence and early crop development. The random roughness created will temporarily reduce the abrasion of sensitive crops. Rotary hoes, sand fighters or similar implements, can create this roughness.

CONSIDERATIONS

This practice should be used when a well-planned and properly applied wind erosion control system fails for reasons beyond the control of the producer. These situations may exist when a low residue-producing crop is harvested too late in a growing season to produce sufficient residue cover, or when the planned erosion control system fails to control erosion during a high wind event.

Wide spacing of chisel points or skip chiseling (alternate chiseled/non-chiseled strips) for the first operation may permit salvaging part of a growing crop of small grain and leave undisturbed soil for later operations, if needed.

Spacing and depth of chisel operation are important to obtain uniform distribution of clods on the surface. Close spacing at shallow depths generally pulverizes the soil, and does not produce enough random roughness to decrease the soil-blowing potential.

Proper tillage equipment matched to the crop being grown and soil is important. In general, chisels or narrow sweeps may reduce potential soil blowing on loamy or fine textured soils. Roughening the soil surface with a lister/bedder or wide shovels on chisel shanks is more effective on coarse textured soils.

PLANS AND SPECIFICATIONS

Plans and specifications for establishment of this practice shall be prepared for each field or treatment unit according to the conditions and criteria in this standard. Specifications shall be recorded using approved specification sheets, job sheets, narrative statements in the conservation plan, or other acceptable documentation.

OPERATION AND MAINTENANCE

This practice will be performed as soon as possible when there is inadequate cover to protect the soil from potential wind erosion events or when a crusted soil condition occurs as sensitive crop is emerging and inadequate crop residues are present.